1. Societal Impacts and Public Perception

Instructor Notes: I am extremely pleased that this presentation is included in the course. I welcome comments & questions & hope to hear from students regularly.

Student Notes:

2. My role - applied geographer

Instructor Notes: Please let me know if you have case studies to share of user surveys or other collaborations between social and physical scientists. Also, please let me know if I can help with the development of questionnaires or surveys.

Student Notes:

3. Five part outline

Instructor Notes:

Student Notes:

Five part outline

- What we have learned since the 1976 Big Thompson Flood
- Recent Boulder, CO project
- 2003 flash floods
- Lessons from elsewhere
- Where we go from here

4. Learning Objectives

Instructor Notes:

Student Notes:

Learning Objectives

1. Identify changes in aspects of the warning process since the 1976 Big Thompson Flash Flood.
2. As shown by the Boulder study, how have sources and dissemination changed?
3. Identify impacts and conventional wisdom that Dr. Eve Gruntfest is evaluating in the 2003-2006 National Science Foundation study.

5. Social science can no longer be an add on

Instructor Notes: What differences will new models and faster computers make if the messages do not get to the vulnerable populations in a timely fashion? Incorporate impact studies when new methods are first adopted.

Student Notes:

Social science can no longer be an add on

- Meteorologists, hydrologists & engineers & social scientists

- Need for hydro-meteorologists

Constant cooperation – a Must

6. Social science lessons

Instructor Notes: These "lessons" are derived from old research. New in-depth studies must be undertaken to challenge these assumptions & earlier findings.

Student Notes:

Social science lessons

- People do not panic in response to warnings

- People rarely get too much information

- "Cry wolf" syndrome may not be applicable if previous misses are understood

7. Social science lessons

Instructor Notes:

Student Notes:

8. The Big Thompson Flood in Colorado140 died - July 31, 1976

Instructor Notes:

Student Notes:

9. The Big Thompson Flood

Instructor Notes: Now that generation is retiring. We need to keep this catastrophic event in public memory so residents, officials, & forecasters recognize that

Student Notes:

The Big Thompson Flood

New focus for next generation of policy makers & scientists involved in flood mitigation

10. 1986Ten years later

Instructor Notes:

Student Notes:

1986 Ten years later

- Signs
- FLASH FLOODS are recognized as different from slow rise floods
- Fewer people
- Real time detection

11. 2004

Instructor Notes:

Student Notes:

2004

Changes in aspects of the warning process

- More federal agencies flood warning
- Increased vulnerability
- ALERT user groups combine detection / response

12. 2004

Instructor Notes:

Student Notes:

2004

Changes in aspects of the warning process

- Real time data – graphical formats
- Very high expectations of NWS forecasts and warnings
- Aging dams/ infrastructure

13. An Evaluation of the Boulder Creek Local Flood Warning System - 2002

Instructor Notes: Report Cover created by Kim Carsell 2002

Student Notes:

14. Report addressed

Instructor Notes:

Student Notes:

15. Methodology

Instructor Notes:

Student Notes:

Methodology

- 60 question survey

- Defined 2 populations of Boulder Creek Floodplain Residents
  - Population A: Not in University of Colorado Family Housing
  - Population B: Living in University of Colorado Family Housing

- Sampled only residents in 100-year floodplain

- 291 respondents, 40% response rate

16. Knowledge of flood terminology

Instructor Notes:
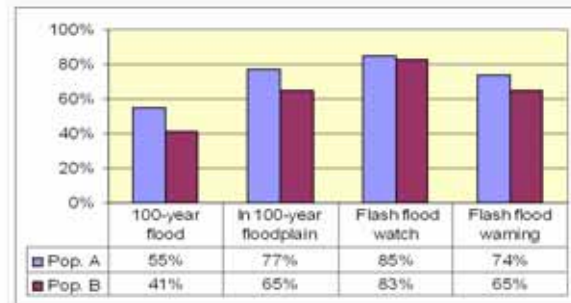
Student Notes:

Knowledge of flood terminology

Q. What does the term "100-year flood" mean?

Q. Is your residence in the "100-year floodplain"?

Q. What does a "flash flood watch" mean?

Q. What does a "flash flood warning" mean?

17. Knowledge of Boulder Creek floodplain residents

Instructor Notes:

Student Notes:

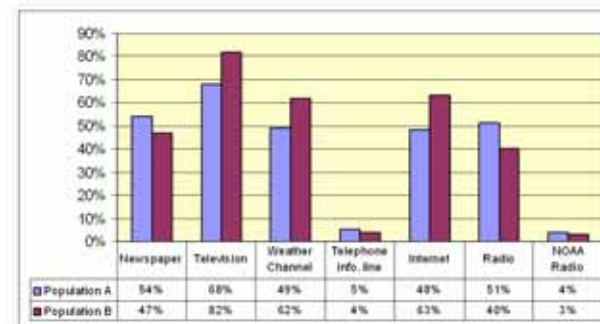
Knowledge of Boulder Creek floodplain residents

	100-year flood	In 100-year floodplain	Flash flood watch	Flash flood warning
Pop. A	55%	77%	85%	74%
Pop. B	41%	65%	83%	65%

18. What are your weather information sources?

Instructor Notes:

Student Notes:

What are your weather information sources?

	Newspaper	Television	Weather Channel	Telephone info. line	Internet	Radio	NOAA Radio
Population A	54%	68%	49%	5%	48%	51%	4%
Population B	47%	82%	62%	4%	63%	40%	3%

19. Warning preferences

Instructor Notes:

Student Notes:

Warning preferences

- Current dissemination via
  - Sirens, Automated call system (R-911)
  - Cable television, Radio, NOAA weather radio

Q. What would be the best way(s) for officials to warn you about imminent flash floods at the following times:
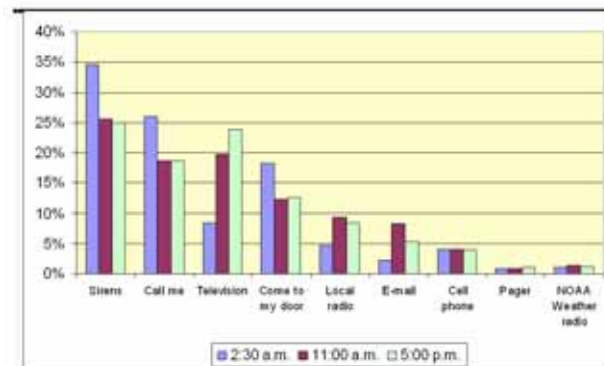
2:30 a.m., 11:00 a.m., 5:00 p.m.

20. Preferred methods

Instructor Notes:
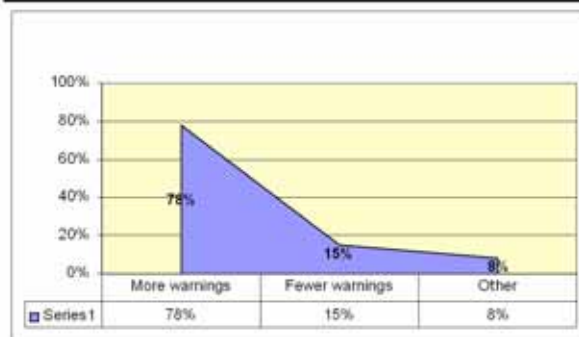
Student Notes:

Preferred methods

21. Would you prefer more warnings even if there were false alarms rather than a missed event?

Instructor Notes:

Student Notes:

Would you prefer more warnings even if there were false alarms rather than a missed event?

	More warnings	Fewer warnings	Other
Series 1	78%	15%	8%

22. Likely actions - driving in deep water

Instructor Notes:

Student Notes:

Likely actions – driving in deep water

Q. You are driving & come to an intersection covered in water up to the middle of your tires, what do you do?

- 15%
- 21%
- 64%

- Go 5 minutes out of way to another intersection
- Drive through it
- Pull over and wait

23. Most important findings

Instructor Notes:

Student Notes:

24. The last major research findings on warnings are 30 years old

Instructor Notes:

Student Notes:

25. Our 2003-2006 National Science Foundation project will

Instructor Notes:

Student Notes:

Our 2003-2006 National Science Foundation project will

- Evaluate impacts of
  - Demographic change
  - New & different sources of information
- Test conventional wisdom about
  - False alarms/ close calls
  - Lead times

For Flash Floods & Tornadoes studying Denver and Austin

26. Toward improved understanding of warnings for short-fuse weather events

Instructor Notes:

Student Notes:

Toward improved understanding of warnings for short-fuse weather events

- Research team of psychologists & geographers
- Results from this research will provide new directions for future warning procedures

27. Recent US flash flood statistics

Instructor Notes:

Student Notes:

28. 2003 noteworthy flash floods

Instructor Notes:

Student Notes:

29. Jacob Creek/Kansas turnpike flash flood

Instructor Notes:

Student Notes:

30. 30 August 2003-- Kansas turnpike

Instructor Notes:

Student Notes:

31. Slide 31

Instructor Notes:

Student Notes:

32. Southern California flash flooding & debris flows

Instructor Notes:

Student Notes:

33. Slide 33

Instructor Notes:

Student Notes:

The mudslides hit areas that were ravaged by wildfires in October.

34. How can we convince people they are better wet than dead?

Instructor Notes:

Student Notes:

35. Up against the auto industry

Instructor Notes:

Student Notes:

36. Lessons from elsewhere

Instructor Notes:

Student Notes:

37. Research issues

Instructor Notes:

Student Notes:

38. Graphical images are everywhere

Instructor Notes:
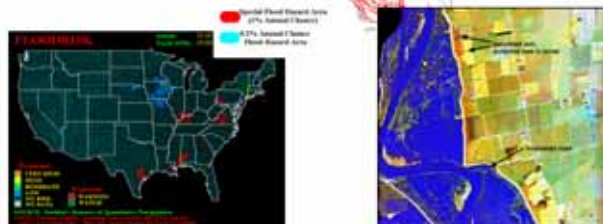
Student Notes:

39. The car is not a boat At 1.5 feet the vehicle moves downstream - public education Maricopa County, Arizona

Instructor Notes:

Student Notes:

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40. Slide 40

Instructor Notes:

Student Notes:

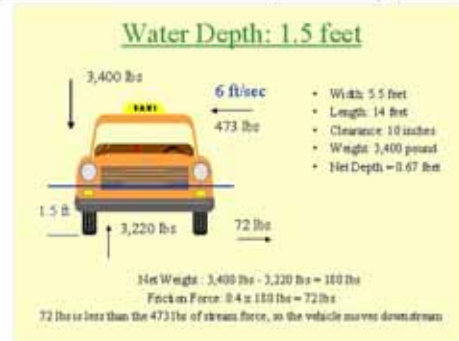

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41. 58 seconds in Tucson, Arizona June 22, 1977.

Instructor Notes:

58 seconds in Tucson, Arizona June 22, 1977.

Photos copyright Jack Sheaffer Arizona Daily Star

42. Dow & Cutter - Hurricanes Bertha & Fran - South Carolina

Instructor Notes: Weather channel, quality of home construction, family situations, fear of delays in being allowed back home

Student Notes:

Dow & Cutter - Hurricanes Bertha & Fran – South Carolina

- People search elsewhere for information to assess their own risk
- "Official" sources are only some of many sources of information

43. False alarm-Ventura, CA a siren test that went wrong

Instructor Notes:

Student Notes:

False alarm-Ventura, CA a siren test that went wrong

- Most said they would heed next siren
- Confidence in warning process was not reduced
- Served as a hands on practice for real emergency – family plans were developed

Carsell's 2001 findings

44. Engineers & social scientists work together - outside the US

Instructor Notes:

Student Notes:

Engineers & social scientists work together – outside the US

- Italian hydrologic engineer Enrica Caporali's flood warning follow-up study
- Two flood warnings in October 1992
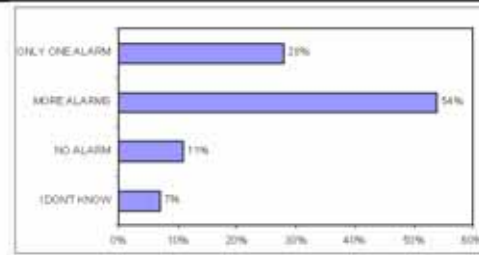 - Telephone survey of 518 residents

45. Memory of the warnings

Instructor Notes:

Student Notes:

Memory of the warnings

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46. After they heard the alarm

Instructor Notes:

Student Notes:

After they heard the alarm

- 43% did nothing - 29% moved vehicles
- 83% judged the warnings positively

High level of public satisfaction with warning
-- but....

THERE WAS NO FLOOD!

- We rarely study warning response –
but never when no flood occurs

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47. Not all floods are equal

Instructor Notes:

Student Notes:

48. Some events are so rare - Are warnings likely?

Instructor Notes: How can such deadly flash flood catastrophes occur with our current levels forecasting technologies?

Student Notes:

49. Key steps

Instructor Notes:

Student Notes:

Key steps

- Develop a national warning strategy

- Identify definitions- for flash floods, for service missions

- Provide incentives for students and researchers
  - Research & workshops

50. Slide 50

Instructor Notes: Observing a slow rise flood is so much different than observing a flash flood, so when I had the opportunity to go to Missouri in 1993 during the devastating midwest floods, I did. Was the answer to the question the Corps of Engineers, the River Forecast Center, the tv meteorologist or some others? I went to Hermann, Missouri for a few days, away from the commotion in St. Louis.

Student Notes:

Who or what warning agency was most credible during the 1993 Midwestern U.S. floods?

51. Slide 51

Instructor Notes: Gentlemen from Hermann, MO on the Missouri River. They have local knowledge & technical data from NWS, Corps of Engineers, local tv/radio and… latest news from "Dave" from the highway department who stops by to give them the an update about whether the access road to the bridges will force road closures later in the day, or whether current heavy rains at Kansas City will compound their local flooding or whether a levee break in an upstream down might reduce their local threat. They also use the "stick" for accurate local measurement.

Student Notes:

52. Slide 52

Instructor Notes: Here are the Hermann residents 11 years later. Note that they have a laptop, a PDA, and a cell phone that provides real-time weather and river data. Would you think that they would also have a new truck? They also still have the "stick".

Student Notes:

53. Expectations for 2014

Instructor Notes: Physical science & engineering advancements will only make a difference if research on warnings, warning response, & risk communication are better understood

Student Notes:

Expectations for 2014

- Numerous "natural" problem solving collaborations between social scientists, physical scientists, & practitioners

- Many "measured" successes – reduced losses

- Reduced vulnerability & integrated warning systems

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54. References

Instructor Notes:

Student Notes:

References

- Carsell, K. (2001). Impacts of a false alarm: The January 29, 2000 Ventura, California experience. Unpublished masters thesis. University of Colorado, Colorado Springs, CO.

- Dow, K. & S. L. Cutter. (1998). Cry wolf: Repeat response to hurricane evacuation orders. *Coastal Management*, 26, 237-252.

- Dow, K. &, S. L. Cutter. (2000). Public orders & personal opinions: Household strategies for hurricane risk assessment, *Environmental Hazards*, 2, 143-155.

- Grunfest, E., Carsell, K. & Plush, T. (2002). An evaluation of the Boulder Creek local flood warning system, *Prepared for the Urban & Flood Control District Boulder City/County Office of Emergency Management*, May 2002.

- Sorenson, J. H. (2000). Hazard warning system: Review of 20 years of progress, *Natural Hazards Review*, 1(2) 119-125.